What is claimed is:

1. A method of processing a substrate in a vacuum chamber, comprising: admitting a substrate into the chamber for processing with a process gas; admitting a process gas into the chamber to process the substrate in the chamber;

restricting the flow of an exhaust gas flow through an exhaust outlet positioned on at least two sides of the substrate of the chamber to a first, non-zero flow rate which is less than 100 sccm to facilitate retaining process gas in the chamber to react with the substrate; and

after sufficient substrate processing with the process gas, increasing the exhaust flow rate to a second, higher flow rate to facilitate exhausting residue gas from the chamber.

2. The method of claim 1 further comprising pumping residue gas from the interior of the chamber and through the chamber exhaust outlet when the exhaust flow is at the second flow rate level.

3. The method of claim 1 wherein said exhaust gas flow restricting is initiated prior to said process gas admitting.

4. The method of claim 3 wherein said exhaust gas flow restricting is continued during said process gas admitting.

5. The method of claim 4 said process gas admitting is terminated during said exhaust gas flow restricting.

6. The method of claim 1 wherein said first flow rate is less than 10 sccm.

7. The method of claim 1 wherein said second flow rate is in a range of 10-20 slm.

8. The method of claim 4 further comprising admitting a purge gas into the chamber when the exhaust flow is at the second flow rate level to purge residue gas from the chamber.

9. The method of claim 1 further comprising admitting a purge gas into the chamber when the exhaust flow is at the second flow rate level to purge residue gas from the chamber.

10. The method of claim 1 wherein said process gas admitting is continued during said exhaust gas flow restricting, causing the pressure in said chamber to rise to a first pressure level.

11. The method of claim 10 wherein said first pressure level is in a range of 5-300 Torr.

12. The method of claim 10 wherein said increasing the exhaust flow rate to a second flow rate causes the pressure in said chamber to fall to a second, lower pressure level.

13. The method of claim 12 wherein said second pressure level is in a range of 5-30 Torr.

14. The method of claim 1 further comprising heating the substrate using a fixed heater disposed in a fixed substrate support.

15. The method of claim 1 wherein said process gas admitting admits one or more deposition process gasses which form onto the substrate one or more layers of one or more deposition materials selected from the group of tantalum, tantalum nitride, tantalum oxide, titanium, titanium nitride, tungsten, tungsten silicide, silicon nitride, and aluminum oxide.

16. A method of processing a substrate in a vacuum chamber, comprising:

reducing the conductance level of a non-sealing flow restrictor surrounding the substrate to a first, non-zero conductance level, wherein the flow restrictor couples the interior of the chamber to an exhaust port of the chamber;

admitting a substrate into the chamber for processing with a deposition gas;

admitting the deposition gas into the chamber to react with a substrate in the chamber while the flow restrictor is at the first conductance level wherein the flow restrictor at the first conductance level limits the exhaustion of deposition gas through the exhaust flow restrictor to the exhaust port to a first, non-zero flow rate to facilitate retaining deposition gas in the chamber to react with the substrate; and

after sufficient substrate processing with the deposition gas, increasing the conductance of the non-sealing flow restrictor to a second, higher conductance level to increase the flow rate of residue gases being exhausted through the flow restrictor to the exhaust port to a second, higher flow rate.

17. The method of claim 16 further comprising pumping residue gas from the interior of the chamber, through the flow restrictor to the chamber exhaust port when the flow restrictor is at the second conductance level.

18. The method of claim 1 wherein said flow restrictor conductance level reducing is initiated prior to said deposition gas admitting.

19. The method of claim 18 wherein the flow restrictor limits the exhaustion of deposition gas to the first flow rate during said deposition gas admitting.

20. The method of claim 19 wherein said deposition gas admitting is terminated during said exhaust gas flow restricting.

21. The method of claim 16 further comprising admitting a purge gas into the chamber when the exhaust flow is at the second flow rate level to purge residue gas from the chamber.

22. A method of depositing deposition materials onto a substrate in a vacuum chamber, comprising:

in a first cycle, closing a non-sealing circular flow restrictor surrounding the substrate wherein the flow restrictor couples the interior of the chamber to an exhaust port of the chamber and admitting a first deposition gas into the chamber to react with a substrate in the chamber while the flow restrictor is closed wherein the closed flow restrictor limits the exhaustion of the first deposition gas through the exhaust flow restrictor to the exhaust port to facilitate depositing a first deposition material onto the substrate;

in a second cycle, opening the flow restrictor and purging the chamber of the first deposition gas while the flow restrictor is open;

in a third cycle, closing the flow restrictor and admitting a second deposition gas into the chamber to react with the substrate in the chamber while the flow restrictor is closed wherein the closed flow restrictor limits the exhaustion of the second deposition gas through the exhaust flow restrictor to the exhaust port to facilitate depositing a second deposition material onto the substrate;

in a fourth cycle, opening the flow restrictor and purging the chamber of the second deposition gas while the flow restrictor is open; and

repeating the above cycles thereby repeatedly and alternately closing and opening the flow restrictor and alternately depositing the first and second materials while the flow restrictor is closed, and alternately purging the first and second deposition gasses while the flow restrictor is open.

23. The method of claim 22 wherein said deposition materials form a plurality of layers on the substrate, said layers including one or more materials selected from the group of tantalum, tantalum nitride, tantalum oxide, titanium, titanium nitride, tungsten, tungsten silicide, silicon nitride, and aluminum oxide.

24. The method of claim 22 wherein an atomic layer is deposited in each of said first and third cycles.

25. The method of claim 22 wherein each cycle is less than 10 seconds in duration.

26. The method of claim 25 wherein each cycle is less than .5 seconds in duration.

27. The method of claim 25 wherein closing the flow restrictor includes seating a circular annular valve body surrounding the substrate against a circular annular valve seat surrounding the substrate and positioned on a lid of the chamber.

28. A vacuum processing chamber for processing a substrate with a process gas, comprising:

a pressure vessel which defines an interior;

a substrate support positioned within said vessel interior and having a support surface adapted to support a substrate for processing;

a process gas inlet disposed in said vessel and having an inlet flow valve to control the admission of a process gas into the vessel interior;

an exhaust outlet having an outlet flow restrictor disposed in said vessel on at least two sides of said substrate support and adapted to exhaust a residue gas from the chamber interior, said non-sealing outlet flow restrictor having a first conductance level and a second, higher conductance level; and

a chamber controller adapted to in alternating first and second cycles, actuate the non-sealing outlet flow restrictor to the first conductance level in the first cycle; and in the second cycle, increase the conductance of the non-sealing outlet flow restrictor to the second conductance level, said controller further being adapted to control the process gas inlet valve to admit a process gas into the vessel interior during at least a portion of the first cycle and to at least reduce the admission of process gas into the vessel interior during at least a portion of the second cycle.

29. The chamber of claim 28 wherein said flow restrictor is near sealing.

30. The chamber of claim 28 wherein the vessel includes a body having an access opening on one side and a lid adapted to close said body access opening, wherein said exhaust outlet includes a passageway formed at least partially by said lid.

31. The chamber of claim 30 wherein said passageway is disposed in said lid.

32. The chamber of claim 30 wherein the outlet flow restrictor is disposed in the vessel passageway formed at least partially by said lid.

33. The chamber of claim 32 wherein the outlet flow restrictor includes a flow restrictor body disposed in said passageway, said flow restrictor further including a flow restrictor seat positioned to receive said flow restrictor body, said flow restrictor seat being formed within said passageway.

34. The chamber of claim 33 wherein said flow restrictor seat surrounds said substrate support.

35. The chamber of claim 34 wherein said flow restrictor body surrounds said substrate support.

36. The chamber of claim 35 wherein said substrate support has an outer perimeter and said flow restrictor body has an inner perimeter wherein said flow restrictor body inner perimeter is positioned entirely outside said substrate support outer perimeter.

37. The chamber of claim 28 wherein the outlet flow restrictor includes a movable flow restrictor body disposed in said passageway and having a first position and a second position, said flow restrictor further including a flow restrictor seat formed within said passageway and positioned to receive said flow restrictor body in said first position to provide said first conductance level of said flow restrictor, said flow restrictor body being displaced from said flow restrictor seat in said second position to provide said second conductance.

38. The chamber of claim 32 wherein the outlet flow restrictor includes a flow restrictor body disposed in said passageway, said flow restrictor further including a flow restrictor seat positioned to receive said flow restrictor body, said flow restrictor seat being formed within said passageway.

39. The chamber of claim 32 wherein said flow restrictor further includes a second flow restrictor seat positioned to receive said flow restrictor body, said flow restrictor seat being formed within said passageway and spaced from said first flow restrictor seat.

40. The chamber of claim 33 wherein the flow restrictor body is annular-shaped and disposed in said passageway and having a first position and a second position, said flow restrictor further including an annular-shaped flow restrictor seat formed within said passageway and positioned to receive said

flow restrictor body in said first position to provide said first conductance level of said flow restrictor, said flow restrictor body being displaced from said flow restrictor seat in said second position to provide said second conductance.

41. The chamber of claim 37 wherein the annular-shaped flow restrictor body is generally circular and the annular-shaped flow restrictor seat is generally circular.

42. The chamber of claim 37 wherein the flow restrictor body is generally disk-shaped and disposed in said passageway and having a first position and a second position, said flow restrictor further including an annular-shaped flow restrictor seat formed within said passageway and positioned to receive said flow restrictor body in said first position to provide said first conductance level of said flow restrictor, said flow restrictor body being displaced from said flow restrictor seat in said second position to provide said second conductance.

43. The chamber of claim 37 wherein the flow restrictor body is generally circular-shaped and disposed in said passageway and having a first position and a second position, said flow restrictor further including a generally circular-shaped flow restrictor seat formed within said passageway and positioned to receive said flow restrictor body in said first position to provide said first conductance level of said flow restrictor, said flow restrictor body being displaced from said flow restrictor seat in said second position to provide said second conductance.

44. The chamber of claim 37 wherein said flow restrictor body is approximately the same size as the substrate support surface.

45. The chamber of claim 37 wherein said flow restrictor body is wider than the substrate support surface.

46. The chamber of claim 28 wherein the substrate support is fixed within the chamber so that the substrate support surface is immovable within the chamber and the substrate support includes a fixed heater coupled to the substrate support surface and adapted to heat the substrate.

47. A vacuum processing chamber for processing a substrate with a deposition gas, comprising:

a pressure vessel which defines an interior;

a substrate support positioned within said vessel interior and having a support surface adapted to support a substrate for processing;

a deposition gas inlet disposed in said vessel and having an inlet valve to control the admission of a deposition gas into the vessel interior;

a processing region within the chamber interior and formed above said support surface;

an exhaust outlet disposed in said vessel and having an exhaust passageway and an outlet flow restrictor adapted to exhaust a residue gas from the processing region, said outlet flow restrictor having an annular-shaped flow restrictor body having an open position and a closed position wherein the open position defines a flow restrictor passageway which surrounds said substrate support and couples said processing region to said exhaust passageway.

48. The chamber of claim 47 wherein said flow restrictor passageway continuously surrounds said substrate support.

49. The chamber of claim 47 wherein said substrate support has an outer perimeter and said flow restrictor body has an inner perimeter wherein said flow restrictor body inner perimeter is positioned entirely outside said substrate support outer perimeter.

50. A vacuum chamber for depositing a plurality of different deposition materials onto a substrate with a plurality of different deposition gasses, comprising:

a pressure vessel which defines an interior;

a substrate support means positioned within said vessel interior, for supporting a substrate for deposition;

process gas inlet means for alternately admitting first and second deposition gasses into said vessel interior;

exhaust outlet means surrounding said support means, for directing residue deposition gasses from the vessel interior;

pump means for pumping residue process gasses through said exhaust outlet means;

outlet flow restrictor means disposed in said exhaust outlet means and surrounding said support means, for

in a first cycle, closing said outlet means while said inlet means admits a first deposition gas into the vessel interior to deposit a first deposition material onto the substrate in the interior while limiting the exhaustion of the first deposition gas through the outlet means;

in a second cycle, opening the outlet means to purge the chamber of the first deposition gas;

in a third cycle, closing the outlet means while said inlet means admits a second deposition gas into the interior to deposit a second deposition material onto the substrate in the interior while limiting the exhaustion of the second deposition gas through the outlet means;

in a fourth cycle, opening the outlet means to purge the chamber of the second deposition gas; and

repeating the above cycles thereby repeatedly and alternately closing and opening the outlet means wherein the first and second materials are alternately deposited while the outlet means is closed, and the interior is alternately purged of the first and second deposition gasses while the outlet means is open.

51. The chamber of claim 50 wherein said deposition materials form a plurality of layers on the substrate, said layers including one or more materials selected from the group of tantalum, tantalum nitride, tantalum oxide, titanium, titanium nitride, tungsten, tungsten silicide, silicon nitride, and aluminum oxide.